White Paper Report

Report ID: 98481

Application Number: HD5046408

Project Director: Nardina Mein (Dina.Mein@wayne.edu)

Institution: Wayne State University

Reporting Period: 9/1/2008-8/31/2009

Report Due: 11/30/2009

Date Submitted: 9/15/2010

Digital Learning and Development Environment White Paper

NEH Digital Humanities II Start-Up Grant ## HD-50464-08

Title of Project: Digital Learning and Development Environment
Institution: Wayne State University, The Office of Teaching and Learning, Technology Resource Center

Project Abstract

Wayne State University's *Digital Learning and Development Environment* was a research and development project aimed at developing a prototype for a systematic approach to digital learning using image repositories. The repositories used in the project were two of the Wayne State University Library System's (WSULS) Digital Collections: *Virtual Motor City* and *Digital Dress*. The Collections are web portals providing universal access to digitized objects of cultural history from dispersed holdings of WSULS's institutional partners. The project integrates easy-to-use technical tools with instructional design principles and resources for digital teaching and learning. The result is a replicable web environment where faculty and students can use accessible tools to easily create Digital Learning Objects (DLOs) from collections of digital images. The unique design of the Environment places images from the Library's Digital Collections in context with a tool that downloads the images into a learning object and also provides expert advice in the design of effective digital media for instructional presentations and assignments.
Award Dates: 01/09/2009 – 08/31/2009 (no-cost extension until 10/31/2009)
Outright Funds: $50,000;

1.0 Project Staff

Principal Investigator, Dr. Nardina Mein

Director of New Media and Information Technology & Interim Director of the Office for Teaching and Learning

Dr. Mein is the Director of New Media and Information Technology at Wayne State University, and is the overall manager for a large portfolio of digital projects, with multiple roles of design, development, implementation, and collection management, preservation and access on the web. She also plays a leadership role in the Digital Partnerships for Engaged Learning, an innovative portfolio of teaching and learning focused digital projects managed within the Technology Resource Center which seeks to foster the use of digital technologies in teaching and learning through faculty collaboration.

A major part of Dr. Mein's responsibilities include media development for instruction, classroom technology design and support, library systems, library public and staff computing and evaluation of teaching and learning technologies for the University. Dr. Mein has written several successful grants, including most recently the Digital Media Learning Environment, a National Endowment for the Humanities grant that supports faculty and students as they create learning objects with images from digital collections. She was also Principle Investigator on the recently completed Library of Michigan Digital Preservation grant, which supported the digitization of images from the Detroit News Collection currently housed in the Reuther Archives at the University.

Dr. Mein received a BA from Michigan State University and a MSLS from Wayne State University in Detroit, Michigan. She received a doctorate in Instructional Technology from Wayne State University in May 2005, specializing in instructional design and message design for online instruction.

Co-Principal Investigator, Dr. Julie Thompson Klein
Professor of Humanities in English/Interdisciplinary Studies and Faculty Fellow in the Office for Teaching and Learning

Klein was responsible for conceptual oversight, submission of the grant proposal and documents authorizing user testing, hiring of initial student assistants, writing and editing website text, coordination of subteams and meetings, and the Teaching & Learning. Archive.

Holder of Ph.D. and Doctor of Arts degrees in English from the University of Oregon, Klein is Professor of Humanities in English and Faculty Fellow in OTL. She has also held visiting posts in Japan, New Zealand, and Nepal, and was Senior Fellow at the Association of American Colleges & Universities. She directs the Digital Humanities Collaboratory on campus and is a member of the national Steering Committee of HASTAC. Her areas of expertise are humanities, American cultural studies, and interdisciplinary history, theory, and practice.

Klein is past president of the Association for Integrative Studies and former editor of Issues in Integrative Studies. She is a member of Wayne State's Academy of Scholars and received the University's highest awards for teaching and research excellence. She also received the Kenneth Boulding Award for outstanding scholarship on interdisciplinarity and the Yamamoorthy & Yeh Transdisciplinary Distinguished Achievement Award. Klein has lectured throughout Europe, North America, Latin America, and Australia.

Her publications include numerous articles and chapters and the authored and edited books *Interdisciplinarity* (1990), *Interdisciplinary Studies Today* (1994), *Crossing Boundaries* (1996), *Mapping Interdisciplinary Studies* (1999), *Transdisciplinarity* (2001), *Interdisciplinary Education in K-12 and College* (2002), *Humanities, Culture, and Interdisciplinarity* (2005), and *Creating Interdisciplinary Campus Cultures* (2010). She is also Associate Editor of the *Oxford Handbook of Interdisciplinarity*, co-editor of the University of Michigan Press series Digital Humanities@digitalculturebooks, and is working on a book on Mapping Digital Humanities.

Team Members

Adrienne Aluzzo, Metadata Librarian

Ms. Aluzzo developed the metadata mapping, normalization, and indexing. She is an experienced metadata and cataloging librarian who has also considerable knowledge in the development of digital collections. Aluzzo brought extensive experience from other projects, insuring that metadata for the images and learning objects were integrated into the database and the overall plan for instructional design guidelines. She also created digital learning objects to serve as examples for the project.

At Wayne State University, Ms. Aluzzo oversees the metadata work of many of the Library's digital collections.

Prior to her work at Wayne State University, Ms. Aluzzo helped develop the digital program at the Detroit Public Library, working on the Hackley African American Sheet Music Project, the Packard and Glidden projects for The Making of Modern Michigan and Early Detroit Images from the Burton Historical Collection at the Detroit Public Library. Ms. Aluzzo also was an original cataloger of sheet music, rare books, audio cds and videos. For many years she was the Trainer/User Support Specialist for Tip Database & Subscriptions, an Information & Referral database and service of the Detroit Public Library.

Ms. Aluzzo managed the Interlibrary Loan function of the Archives of American Art (Smithsonian Institution), which was an international program. She also provided

research assistance to scholars, processed archival collections, and created finding aids and catalog records for the collections.

Ms. Aluzzo received a BA and MSLS and Graduate Certificate in Archival Administration from Wayne State University in Detroit, Michigan. She is currently working on a Master's degree in Cultural Anthropology also at WSU.

Dr. Anne-Marie Armstrong, Instructional Designer

(Former) Instructional Designer in the OTL, designed online learning components of instruction and worked with faculty. She has extensive experience building instruction and is particularly skilled in the design and development of learning objects and learning objectives. She worked closely with Mein and Klein, and Matt Decker and Neds-Fox, the Web Administrator and Web Designer respectively. Dr. Armstrong, along with Neds-Fox and Decker, supervised two student assistants hired for assistance with programming, graphic design, and writing of the web-based workspace.

Dr. Anne-Marie Armstrong produced training and instructional materials on Learning Objects, Digital Learning Objects, Media Objects and advised on the use of the digital collections for instructional and training purposes. Armstrong researched current literature and surveyed faculty on the use of learning objects. One of the products of her research was the Checklist for Assessing Media Projects and Learning Objects which is incorporated into the Sandbox Digital Learning and Development Environment project. She worked with the web designers to ensure the inclusion of good human factors and universal design principles in the final product and provided technical training to the project team when needed. Using Flash and Camtasia, Armstrong designed, developed and delivered samples and presentations both online and at regional and national academic conferences.

Dr. Armstrong received a BA from the University of Missouri and a Masters degree in Education, specializing in Curriculum and Instruction, at the University of West Florida. She received a doctorate in Instructional Design and Development from the University of South Alabama in 1998. Armstrong earned certification in Museum Studies from George Washington University in 2004 and is a Certified Professional Logistician.

Matthew Decker, Associate Director of Digital Library Initiatives

Matthew Decker has served in several job roles for Wayne State University. He currently is the Associate Director of Digital Library Initiatives for the New Media and Information Technology department of the WSU Library System. Matthew was involved in the the two digitization grants that originally created the Virtual Motor City and Digital Dress collections that are used in this project.

Matthew provided the overall supervision and general guidence for the technical aspects of this project. He also provided the initial hiring and project management roles which were later assumed by Jonathan McGlone. During the evaluation stage, he helped with conducting talk-aloud sessions.

Matthew received a Bachelors of Science in Information Systems Management from Wayne State University.

Jonathan McGlone, Web Librarian: Digital Projects

As Web Librarian for Wayne State University Library System, McGlone manages WSU's digital collections and institutional repository. His areas of research interest are in digital collection usability, open access, and scholarly communication. Received B.A. from Calvin College in Film Studies/Communications (2005) and his M.L.I.S. from Wayne State University (2008).

For the Digital Learning and Development Environment, McGlone acted as project manager, overseeing the design and development of the bridge to WSU digital collections, the Digital Learning and Development Environment website, and interactive Teaching and Learning Archive. In addition, McGlone identified the need to improve accessibility to Virtual Motor City (VMC), initiating changes to VMC metadata and interface. McGlone also participated in the usability study and assessment of the Digital Learning and Development Environment and presented the project with DLDE team members Klein and Armstrong at EDUCAUSE 2009 Midwest Regional Conference in Chicago, IL.

Joshua Neds-Fox, Web-Librarian

Joshua Neds-Fox, Web Librarian for the Wayne State University Library System, oversees the libraries' various websites -- designing, managing and maintaining the libraries' online presence, and working with the larger library system to bring new ideas online. He is responsible, in collaboration with the Digital Library Initiatives Team, for designing and developing the most recent incarnation of the WSU Library website, and led that project from inception to evaluation. Joshua received his BFA in Theater from Wayne State University (1996) and his MLIS from Kent State University (2003).

Working from a skeleton plan researched and begun by Safwan Al-Omari, Joshua developed the initial code for the tool translating a portfolio from the online collections into a downloadable learning object. Joshua directed the two student programmers (Fady Banno / Sahana Bangalore Nagaraja) in further code refinement and in the initial design of the DLDE website, and completed the code that allows users to choose a second learning object format.

Student Assistants

Sherry Tuffin, Project Assistant

> Sherry Tuffin is a graduate student in the Master of Library and Information Science program (MLIS) and is the 2009-2010 HASTAC scholar for the Office for Teaching and Learning (OTL) and the Technology Resource Center (TRC).
>
> Her responsibilities to the DLDE project included exploring the Virtual Motor Collection and the Digital Dress Collections, and selecting appropriate photographs for the purpose of creating sample multimedia digital learning objects. She provided feed back to programmers and designers on the ease of importing images and metadata from the digital repositories into portfolios and then into presentation software (Power Point and Camtasia [Haven't we folded Camtasias into flash videos now? Check with Jon on the best wording.]) for creating multimedia DLOs for teaching and learning presentations and assignments. Further, Tuffin conducted research for additional learning objects repositories and reported on several including: MERLOT, New Media Consortium (NMC), including others . Additionally, Tuffin assisted in the faculty focus testing and in writing text for the final website.

In the course of performing their work, all three of the following Student Assistants were also mentored closely by the technical experts on the team: Neds-Fox, McGlone, and Decker.

Safwan Al-Omari, Programmer

> Performed initial research to evaluate requirements for the technical architecture of a web-based workspace and compatible tools for transporting images and metdata from the Collections.
>
> In 2009, he received his PhD in Computer Science from Wayne State University. He currently works for Amazon.com in Seattle, WA.

Fady Banno, Web Designer and Programmer

> Banno performed programming work for the first bridge tool which exported portfolios to PowerPoint, and performed initial web design of the DLDE.

Sahana Bangalore Nagaraja, Programmer

> Nagaraja performed the programming work for the second bridge tool, which exported portfolios to HTML.

2.0 Project Background

Virtual Motor City and *Digital Dress* were created by Wayne State University Library System (WSULS) in collaboration with its partner institutions, including the Wayne State University Reuther Archives, the Detroit Historical Museum, the Wayne State University Historic Costume Collection, the Meadow Brook Hall and The Henry Ford. The collections feature cultural objects ripe for study within a wide array of disciplines and interdisciplinary fields.

Virtual Motor City
A subset of photos from more than 800,000 selected negatives from the Detroit News photo morgue. The photos document American social history, including the automobile industry, business and labor, architecture, politics, sports, and entertainment from 1868 to 1980.

Digital Dress
5,000 digital images of Detroit-worn clothing and accessories documenting changes in popular culture, industrialization, inventions, labor organization, and Detroit's socio-economic, racial, and ethnic mix during the period spanning 1800 and 2000.

The Collections are also accessible from the WSULS homepage at http://digital.lib.wayne.edu. They may also be previewed in a short Digital Collections Video on the WSU/HASTAC website.

Digitization of the objects was made possible by earlier external grants from the Institute of Museum and Library Services and the Library of Michigan.

2.1 Need for the Project

The Collections are accessed thousands of times per month. However, their use in online instruction is limited by three barriers that have resulted nationally in widespread underuse of digital repositories (Use and Users of Digital Resources, 2005-2006: http://cshe.berkeley.edu/publications/publications.php?id=211; Using Digital Images in Teaching and Learning, 2006: http://www.academiccommons.org/imagereport).

The **first barrier** is technological. Early adopters and faculty innovators are using the latest technologies (e.g., blogs and wikis, synchronous "live classrooms," messaging, digital video, and virtual worlds). However, their usage is sporadic and inconsistent.

The **second barrier** is inadequate planning and preparation for teaching with new technologies. They are often incomplete, and feedback from users is insufficient. Many universities and colleges provide faculty development for instructional design,

pedagogies, and technology use. Rarely, though, are all services co-present and integrated into the design of particular projects.

The **third barrier** is an inadequate knowledge base for using digital collections. Information is often ad hoc, resulting in hit-and-miss use of online resources by both faculty and students. It is not necessarily credible, either, lacking grounding in principles of sound research.

The project addressed all three barriers by taking the next step in instructional design for using digital collections. It created tools for importing images and metadata information about them from the WSULS Collections into a new web-based Digital Learning and Development Environment. The Environment, called the Sandbox* is a workspace where faculty and students can create multi-media Digital Learning Objects (DLOs). A Teaching and Learning Archive in the DLDE guides the process of incorporating credible research materials into DLOs, and also allows users to contribute and share their own DLOs and research materials. Although some resources are restricted to Wayne State faculty and students, other institutions can duplicate the pathway model we devised for bridging national and local research resources.

**Sandbox is a term in software development referring to a virtual environment that allows experimental testing of programs, codes, and other features before going "live" with a developed model.*

3.0 Project Design and Lessons Learned

The instructional design challenge for this project was complex. The environment is digital and the intended audience is diverse in subject knowledge and technical sophistication. The audience also spans high school and post-secondary teachers as well as the educational departments of museums and archives. Four features were central to the project: the technologies, the environment, the method, and the approach.

The Technologies

The project employs a number of technologies. Images are searched through University of Michigan's DLXS (Digital Library Extension Software) digital collection software. Using DLXS, users gather images into portfolios, which are recorded in a MySQL database. Using PHP's MySQL connectivity, the software retrieves a user's portfolio, harvests images and metadata using OAI-Protocol for Metadata Harvesting, and then exploits PHP's DOM object class to assemble those elements into a digital learning object (DLO), using the PresentationML format of the open-source Office Open XML (OOXML) standard. PresentationML is the format used in Microsoft's PowerPoint 2007 presentation documents, and the DLO can be viewed in that software. This same process is leveraged to provide an HTML version, for use

in a web browser, as a second option for users. Because these technologies are open source and standardized, the project software can be adapted to other output formats as they emerge.

The Environment

The Digital Learning and Development Environment (DLDE) is a web-based workplace for users, designed to orient users to WSU's Digital Collections, provide instructions for searching images and using Digital Collection tools, explains how to create DLOs with samples, and provides guidelines for locating and using online research sources.

The Method

Digital Learning Objects (DLOs) combine multi-media content for presentations in both instruction and assignments. New Media Consortium (NMC) defines digital learning objects as "small units that can be fitted together to produce customized experiences triangulating content, interface, and metadata:"

Content	Interface	MetaData
Documents, pictures, simulations, movies, sounds, etc.	Medium through which users interact with objects with alternative formats	Information about objects (author, creator, subject area, copyright)

(The composite chart is based on Rachel Smith, Guidelines for Authors of Learning Objects. New Media Consortium 2004).

The Approach

The design challenge addressed a major challenge to greater use of the collections: there is no bridge between digital collections and the learning object in the classroom. To overcome widely varied levels of technical sophistication among users, the team needed to create an intuitive bridge that would make it easy to choose items from a digital collection and use them in a learning environment.

Because the DLXS software used for Wayne State's digital collections is highly customized, it quickly became evident that the team would need to create an in-house tool. Although different output formats were considered (including eXe, CFKeep and Pachyderm), PresentationML was chosen because it is discrete (does not require a hosting server), open source, fully documented and easily manipulated with PHP. (Pachyderm is in consideration as a possible third option, if and when a new version is released and its documentation evaluated.)

User testing with 'talk-aloud protocol' helped the team identify a few consistent problems with the software, for further refinement. Users had trouble following the steps necessary to use the software; the team refined the design to guide users step by step, easing their transition between one aspect of the software and the next. In addition, users had difficulty searching and finding relevant results from our Virtual Motor City collection; the team made extensive additions to the descriptive metadata in that collection, and enabled additional methods of access, including subject browsing and topic selection.

4.0 Evaluation

The evaluation plan for the Digital Learning Development Environment included usability testing, heuristic, formative, summative and confirmative evaluation methods.

Phase One

The DLDE Team evaluated potential tools for feasibility, designed a prototype for the web environment and critiqued iterative drafts of the design and content for the web environment.

The effectiveness of the Environment was reviewed in the process by collaborating with WSU School of Library and Information Science. Ideas and feedback from these sessions were incorporated into the DLDE design.

A heuristic evaluation (evaluation of the design elements which impact perception and cognition such as font color and use of space.) of the DLDE web site began in phase one and continued throughout the design and development process, incorporating design decisions so that the wide audience could use the site successfully.

Phase Two

Formative evaluation continued as we evaluated the technical features of the PowerPoint tool, the web environment design and refined content for the web environment.

Phase Three

Usability testing took place as part of the formative evaluation strategy. By using the "talk aloud protocol," faculty input was gathered on how well the DLDE could be

used to design Digital Learning Objects with images from the Digital Collections. Faculty worked through the features of the DLDE to create a learning object to be used in a course they teach. DLDE Team members sat alongside faculty testers, provided a brief orientation and training session, and recorded the process that faculty used to create a Digital Learning Object, including issues and "stuck points." We concluded by asking the following questions:

1. How easy was the tool to use?
2. How easy was it to search and transpot images from the Collection in order to create learning objects with images and metadata?
3. In what ways would this tool be of use to you for teaching and learning in general and in particular settings?
4. Were there any areas in which difficulties arose?
5. What advice would you give for improving this tool?

Based on answers to these questions and each faculty tester's recorded experiences, the most frequent problems from the usability study stemmed from the interface design of the bridge tool. These problems were addressed first. In addition, the web and metadata librarians were able to identify long-term issues with the digital collections not directly related to the project.

First, participants had varying degrees of difficulty remembering what step to take next. Most frequently, participants did not know what step to take after creating a portfolio in DLXS. As a result, the website and technical designers decided that the bridge tool needed to both simplify the explanation of the steps and incorporate each step into the interface to improve the guidance of users.

Second, participants had difficulty locating the bridge tool on the HTML page. Despite its location on the top of the HTML page, the tool's interface needed to be designed to make it appear more prominently on the page. The designers decided that if the page design looked more like an application than a regular website, the bridge tool would become the most prominent portion of the page. In addition, actions (such as selecting a portfolio to transform to PowerPoint) were placed directly with the step number to synchronize design.

Third, participants were interested in using the tool with collections other than Virtual Motor City and Digital Dress. To provide for this need, designers included a list to all WSU digital collections that used the DLXS software and were compatible with the DLDE bridge tool (compatibility required a collection to be OAI-PMH compliant).

A more long-term and previously identified problem was that participants struggled with searching the Virtual Motor City. Most frequently, participants were too specific in their search terms when first searching the Virtual Motor City. Their first and second searches were unsuccessful, largely in-part to being too specific without

knowing what topics the Virtual Motor City covered. Part of this problem was created in the design of the usability study, which did not allow for alternative methods for accessing the collections, such as browsing by subject or topic. While solutions to this problem are discussed in 3.0 Project Design, the team has suggested that production of original metadata could be increased by offering metadata practicums for Masters of Library Science students attending Wayne State University's School of Library and Information Science.

Phase Four

Including the no-cost extension until 31 October 2009, we incorporated feedback described above in Phase Three and continued ongoing technical testing and iterative drafts of content. The faculty evaluation focused on the portal as a teaching tool and individual preferences for using it. The team also conducted a final overall evaluation of the project and implemented improvements.
Summative evaluation will continue beyond the period of the grant, as the completion of the DLDE is announced to the Wayne State University campus, and faculty begin using it in their instructional presentations and assignments. Research will be conducted on the impact of the DLDE on teaching and learning processes, assessing student learning to determine whether instructional objectives have been met and the amount and kind of learning that has occurred. In addition, a study of learner and faculty preferences will be conducted. The student evaluation will focus on usefulness of instructional strategies and the constructivist learning model. The faculty evaluation will focus on the portal as a teaching tool and faculty preferences for using it as a means of developing image-based learning objects.

5.0 Dissemination Plan, Presentations, and Publications

The dissemination plan spans both local and national levels. At the local level, the Office for Teaching and Learning (OTL) will sponsor a campus-wide launch of the Digital Learning and Development Environment (DLDE) and DLO method in January 2010, as part of the OTL's programming for the faculty learning community known as the Digital Humanities Collaboratory. Team members will demonstrate the final product then offer follow-up training workshops and individual consultations. Two members of the faculty focus group have already pledged to use the Collections and DLDE in their classes during the 2009-2010 academic year, and that list is growing. The Student Technology Studio will also be available to help students in building their own learning objects. In addition, the team will coordinate with our museum and archive partners who were involved with Virtual Motor City and Digital Dress on further dissemination through their professional networks and contacts in schools throughout the Detroit Metropolitan area. Through these means, we will continue building a Digital Collections Teaching Community.

At the national level, we will make the product available as a universally accessible web portal. Members of the team will also present the model and lessons learned to the design community at large in conference presentations for pertinent professional organizations, including EDUCAUSE, the Association of Educational Computing and Technology, the American Library Association, Coalition for Networked Information, and HASTAC (Humanities, Arts, Science, and Technology Advanced Collaboratory). During the grant period, we have already made two presentations of work-in-progress and have planned a presentation for 2010:

Presentations

- Demonstration of the DLDE project at 2009 Midwest EDUCAUSE conference March 23-25 in Chicago, Illinois, with presentation materials online (http://tinyurl.com/educause-dlde). By team members McGlone, Armstrong, and Klein.

- A poster session demonstration of the DLDE test site at the 2009 HASTAC III Conference, held 19-21 April in Urbana-Champaign, IL. By team members Klein, Mein, Armstrong, and Ian Chapp (2008-2009 WSU HASTAC Scholar). We also showed the DLDE in a formal presentation on WSULS's portfolio of *Digital Partnerships for Engaged Learning*.

- A presentation of the DLDE project accompanied by gathered data on usage in the classroom is planned for April 12-13, 2010 at the Coalition for Networked Information (CNI) Task Force Meeting in Baltimore, Maryland.

Publication

- The team plans to expand this White Paper into a collaborative publication in a hybrid print and digital format, to be submitted to a forum such as the *International Journal of Learning and Media* or *Digital Humanities Quarterly*.

- Klein will be citing the DLDE project in an analysis of digital teaching and learning in a new book on Mapping Digital Humanities, a volume slated for the new University of Michigan Press series Digital Humanities@digitalculturebooks. McGlone is the technical designer for this hybrid print and digital publication, and Tuffin served as a research assistant (using private research funds).

6.0 Long-term Significance of Project

The long-term impact of this project will be two-fold. The first impact is technical in nature, though it bridges technological and instruction design challenges. The final product removes a number of barriers that have prevented wider use of Wayne State's Digital Collections. Because it provides a system for integrating tools with instructional principles and support strategies, along with a method for creating Digital Learning Objects (DLOs), the prototype suggests an approach that can be applied to other repositories.

Wayne State University Impact

The implementation at Wayne State University includes an announcement and presentation to the Digital Humanities Collaboratory in January, 2010 and the launch of the DLDE on the Wayne State University Digital Collections website for use by all. Ongoing support for use of the DLDE is available through consultations and workshops sponsored by the Office for Teaching & Learning and the Wayne State University Library System partners on the Team will continue to provide expertise and instruction as the project and associated research moves forward. Impact of the DLDE will be measured as part of the summative evaluation and will be supported and developed on a long term basis.

National Impact

We find ourselves in a pivotal point in time with respect to the relationship of humanities scholarship and technology. The nature of research in the academic and scholarly community continues to develop at a rapid pace, and incorporates increasingly sophisticated technological tools, redefining our concept of collections and collection development. As we create digital archives and library collections in collaboration with scholars, many questions come to mind, including the long term preservation of the various formats, usability of the created online systems, and the increasingly central place of these digital collections within the scholarly community. Most art and humanities collections exist in academic institutions to which scholars must travel far distances. The goal of many academic libraries and archives is to move these collections out into the digital environment, and make them accessible to view worldwide for the first time. This new access will likely create additional demand for an efficient way to import images and metadata into digital learning objects. To assist faculty and students, the software design of the DLDE will be made available to the academic and scholarly community, and all are welcome to use the unique technology that was developed as part of this project. Plans are underway to begin this distribution through a Creative Commons license.

The second and equally complex impact is intellectual in nature. This project was a testbed for defining a philosophy of digital teaching and learning in the Technology Resource Center's (TRC) expanding portfolio of *Digital Partnerships for Engaged Learning*. Three concepts have emerged that are becoming cornerstones of an integrated philosophy in the TRC.

Constructivist Learning

The "constructivist" theory of learning holds that individuals construct new knowledge from their experiences. It emphasizes active involvement, exploration and discovery, inferences, and reflexivity, not passive delivery and receipt of pre-determined meanings. Teachers become facilitators, and students make meaning through interactions with peers and course environments. Students need a structure providing guidance and parameters. They also need sound scholarly resources. Yet, the learning process is generative and open-ended. Student assignments which include the creation of DLOs provide a dynamic and flexible method for constructing new understandings, sharing and assessing them with others, and arriving at a more complex understanding of the topics and subjects being engaged in any educational setting.

Digital Storytelling

The Digital Learning and Development Environment (DLDE) project has clearly shown that digital learning objects (DLOs) can be an effective method of constructivist learning. A new area that lends itself to constructivism is digital storytelling, defined by Leslie Rule of the Center for Digital Storytelling as, "the modern expression of the ancient art of storytelling" (2009). The fusion of technology with storytelling can be a powerful collaborative educational experience in which students learn how to: research, write, interview, present, assess, solve problems, and work with others. Margaret Nellis of the University of Wisconsin notes "digital storytelling provides avenues for experiential learning, reflective practice, effective communication, and building community in the classroom and beyond" (2009). In a digital age we need new literacies that balance the mastery of technical tools with the learning skills necessary to construct and understand narratives of human experience. The foundation built with the DLDE project can serve as a starting point for exploring the links between constructivist learning and digital storytelling.

Architected Meaning

From the beginning we speculated that the abstracting and scaffolding capacity of DLOs would be complementary to Strain & Van Hoosier-Carey's

concept of "architected meaning." Interdisciplinary connections are fostered by a hypermediated web of juxtapositions and associations that catalyzes humanities and social science methodologies, facilitating an interactive approach to studying cultural history. Architected meaning stimulates a new relationship between technology and humanities as well, grounded in the intersections of textuality, visuality, and aurality in production and use of cultural objects ("Eloquent Interfaces." Eloquent Images, ed. M. Hocks and M. Kendrick, 257-81. Cambridge: MIT Press, 2003).

The concept of "architected meaning" also has technological and organizational implications for this project. It has been a seedbed for an integrative philosophy of digital media and learning being developed in a number of other projects.

Architected meaning has a final significance for this project because of its location. The staff of this project all work within a suite of offices known as the Technology Resource Center (TRC). The TRC is part of the Wayne State University Library System, though another unit that reports to the Office of the Provost, the Office for Teaching and Learning, is also housed physically within the TRC. The co-location and shared mission of these two units is vital to the quality of this and many other projects. Both units are devoted to bridging new technologies and instructional design. Their long-term alliance will be key to nurturing future projects.

For example, *Digital Partnerships for Engaged Learning* is a joint initiative of the Wayne State University Library System and the Office for Teaching & Learning which fosters purposeful integration of digital media in teaching and learning by bridging faculty and TRC expertise, building faculty learning communities, and collaborating with other institutions in the community. The partnership incorporates the study and use of new technologies in teaching and research, the impact of new technologies on the creation and preservation of scholarly collections, and the state of the art regarding intellectual property rights in the academy.